



CONESTOGA-ROVERS
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June 29, 2001

US EPA RECORDS CENTER REGION 5



Reference No. 15670

Mr. Kevin R. Adler
Remedial Project Manager
Superfund Division
U.S. Environmental Protection Agency – SR-6J
77 West Jackson Blvd.
Chicago, Illinois 60604

Approval
7/13/2001
KA

Dear Mr. Adler:

Re: Responses to U.S. EPA Comments
Pilot Project Report
Waukegan Manufactured Gas & Coke Plant
Waukegan, Illinois

We are in receipt of the U.S. Environmental Protection Agency's (U.S. EPA's) comments on the document entitled "Pilot Project Report, Waukegan Manufactured Gas & Coke Plant, Waukegan, Illinois" prepared by Conestoga-Rovers & Associates (CRA) on behalf of the Waukegan Manufactured Gas & Coke Plant (WCP) Group. On behalf of the WCP Group, CRA submits these responses to the U.S. EPA's comments on the Pilot Project Report. The U.S. EPA's comments are reiterated below followed by the responses.

The Pilot Project Report was revised, as necessary, consistent with the responses provided herein. One copy of the revised portions of the Pilot Project Report (text, Appendix A, Appendix D, and Appendix P) is enclosed. As discussed, please replace the corresponding sections of the March 2001 report with the enclosed revised sections. Additionally, an index of the electronic files on CD in Appendix C also is enclosed. The CD index is three-hole punched for inclusion in Appendix C.

GENERAL COMMENTS

General Comment No. 1

Please place a discussion about nitrate production and the subsequent fate of the nitrate once reinjected into the aquifer, into any subsequent report generated on the testing for ammonia removal. In particular, it may be important to discuss the degree of denitrification that is expected to occur in the aquifer based on the biological oxygen demand (BOD) remaining following completion of the cell extraction/reinjection treatment. For example, will high BOD recreate the high ammonia levels in the groundwater from the reinjected nitrate-rich groundwater?

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Response

As requested, information on the production and fate of nitrogen will be included in subsequent documents including the supplemental treatability study and the various design submittals to be generated under the Scope of Work (SOW). However in general, biological activity does not produce high concentrations of free ammonia in solution from nitrate. In addition, it is expected that through a combination of treatment and aquifer mixing due to the extraction and reinjection of groundwater, BOD levels in the lower portion of the aquifer will decline. Thus, the example noted in the comment would not be a concern. The likely fate of the nitrate, in the presence of microbes and a food source, is denitrification, a process that will use available BOD and generate nitrogen gas.

General Comment No. 2

Although the document was generally well written, there were a few inconsistencies in terminology used, leading to some confusion during the review. For example:

- a. *Does the phrase "Pilot Study" refer only to the operational periods or does it include the pre-, post-, and during-operation periods? Are the phrases "Pilot Study" and "Pilot Project" the same?*
- b. *Does the term "E Unit" refer to just EW-04 or does it include both EW-04 and WN-03?*
- c. *When referring to "monitoring wells" does that include the nested monitoring wells for the E and E/R Units as well as the existing site monitoring wells or only the nested monitoring wells?*

Response

The term "Pilot Study" has been dropped from the text of the report in favor of the term "Pilot Project" and the terms "pre-extraction" and "post-extraction" will be used to refer to groundwater monitoring events completed before pumps were turned on or after the pumps were turned off. Use of the terms "E Unit" and "E/R Unit" is inclusive of all wells (extraction, monitoring, and in the case of the E/R Unit, reinjection wells). Except as noted otherwise, the term "monitoring wells" refers to those wells, installed in clusters, for the specific purpose of monitoring groundwater in the Pilot Units (E and E/R Units). As noted in Sections 2.3.2 and 2.3.3 of the report, during the Pilot Project groundwater levels were recorded and response tests were performed using monitoring wells installed during the Remedial Investigation (RI).

General Comment No. 3

Please provide an index with the file path, file name, and table title for the graphs provided on the compact disk.



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Response

The requested file index has been added to Appendix C.

SPECIFIC COMMENTS

Specific Comment No. 1

Section 2.3.4, page 6: This section (and Sections 4.6.4 and 5.5) describes the cone penetrometer testing (CPT), electrical conductance (EC) and ultraviolet fluorescence (UVF) testing (and results) performed by Stratigraphics. Did the testing by GeoProbe using the membrane interface probe (MIP) provide any useful results?

Response

The Geoprobe™ equipped with the MIP was not part of the scope of work for the Pilot Project. Rather, Outboard Marine Corporation (OMC) arranged the demonstration through Geoprobe's corporate office and no report was received from the vendor for inclusion into the Pilot Project Report. The Geoprobe™ unit was equipped to record conductivity, speed of advancement, temperature of the probe, and Flame Ionization Detector (FID) response. The operational principle of the MIP is that volatile organic compounds (VOCs) present in the subsurface will contact and pass through the heated polymer membrane-equipped MIP probe. An inert carrier gas then delivers the VOCs to the FID through inert tubing.

The conductivity data obtained during borehole advancement was similar to the conductivity data obtained during the EC/UVF testing completed during the Pilot Project, a marked response in conductivity was noted near the bottom of the upper aquifer. However, the FID response did not bear a resemblance to the known concentration profile in the upper aquifer. This was likely due to the relatively low concentrations of VOCs and relative to the other compounds of concern (total cyanide, phenolics, ammonia, etc.), the non-responsiveness of the FID and/or the relative difficulty in mobilizing these compounds through the membrane of the MIP probe.

Based upon the results obtained during the demonstration, the technology was not carried beyond the demonstration phase and was not reported in the Pilot Project Report.



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Specific Comment No. 2

Section 3.3, page 9: Figure 3.1 shows the spatial relationship of the wells within the pilot units. An inset could be placed on Figure 3.1 to relate the orientation of the pilot units to the rest of the site. A line showing the location of A-A' (used for the Figure 4.1) should also be included on Figure 3.1.

Response

The spatial relationship of the Pilot Units to the rest of the Site is shown in Figure 2.1. Due to the relative scale between the Site and the pilot units, an inset was not added to Figure 3.1. However, a reference to Figure 2.1 was added to Figure 3.1 to direct the reader to that figure to see the location of the pilot units on the Site.

Specific Comment No. 3

Section 3.3.1, page 9: This section presents the extraction unit (E Unit) as operating under a steady state and a pulsed condition. The operation of the E Unit consisted of cycles of one week of pumping followed by one week of shutdown. During the time the unit was operational, the flow rate was constant. Is this type of operation truly a "pulsed condition" or rather just "cyclic" extraction?

In addition, the unit was operated under four (not three) different extraction flow rates.

Response

The use of the term "pulsed condition" in reference to the stepped operation of the E Unit pumping rates is consistent with the terminology used on Page 4 of the Pilot Project Work Plan (NewFields, Inc., May 23, 2000). It is most precise to say that the E Unit was operated over four one-week cycles and at progressively lower extraction rates during each successive operational cycle. The first three operational cycles were followed by a one-week shut down period. The text was modified accordingly.

Specific Comment No. 4

Section 3.3.5, page 10: This section, titled "Pre and Post Pilot Project Groundwater Monitoring" also discusses samples collected "during implementation of the Pilot Project."

In addition, this section indicates that a groundwater-sampling event occurred prior to initiation of the Pilot Project, but the results don't appear to be presented. The data presented begins on October 2, 2000 which is the day the E Unit pump was turned on. This section should provide more detail including sampling dates, and on and off date for pumps, and specific locations where samples were collected.



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Response

The text in this section was revised to discuss only the pre- and post-extraction monitoring completed during the Pilot Project. The groundwater samples were collected prior to startup on the date that the pilot units were turned on. As such, the date the pumps were turned on and the date of the first sample are the same. This is consistent with the pre-extraction groundwater monitoring protocols specified on Page 15 of the Pilot Project Sampling and Analysis Plan (SAP), which states that the pre-extraction groundwater samples will be collected within 24-hours of startup of the pumps.

All groundwater analytical data compiled during the Pilot Project is summarized in the tables in Appendices F through H and in the graphs in Appendices C, M, N, O, and P. More detail was added to this section of the Pilot Project Report as requested by the Agency.

Specific Comment No. 5

Section 3.4.2.2, page 13, bullet vi.: The pumps were started on October 24, 2000, not November.

Response

The date was revised in the text of the report.

Specific Comment No. 6

Section 3.4.4, page 15: The dates of operation (i.e., on and off dates of the pump) corresponding to the various flow rates should be provided.

Response

The requested information is included in Table 4.5. The discussion in Section 3.4.4 was revised to include a specific discussion of pumping dates during the Pilot Project.

Specific Comment No. 7

Section 3.5.1, page 16: The second last sentence states, "purging to achieve general field parameter stabilization was allowed..." This implies that purging was performed which contradicts the previous sentence that indicates that purging was not performed. Please clarify.



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Response

Some groundwater needed to be run through the flow-through cell to allow equilibration of the probes used to measure field parameters. Therefore, a limited volume of groundwater was purged from the wells to obtain accurate field parameter measurements. The text was modified to reflect this information.

Specific Comment No. 8

Section 4.6.4, page 25, last sentence: Reference should be made to Appendix J, not K.

Response

The text was revised to include the reference to Appendix J.

Specific Comment No. 9

Section 5.2, page 26 - General Comment – The pre and post results are discussed in some sections and not in others. In addition, the corresponding graph did not consistently show the pre and/or post results. The discussions and corresponding graphs should include the pre and post results, specifically the post-shutdown condition.

Please include the dates of when the pumps turned on and off. In addition, some indication of when a sample was collected relative to pump turn on or shut down should be included. For example, the pump for the E Unit was started on October 16. A water level measurement and groundwater sample were also collected on that day. Although it is assumed that these were collected prior to the start of the pumping, it is not apparent from the data tables or graphs.

Response

Please note that post-extraction groundwater samples were collected only from the nested monitoring wells constructed in each of the pilot units (i.e., WN-1 and WN-2 in the E/R Unit and WN-3 in the E Unit). Therefore, the only graphs that depict post-extraction data are the well nest WN-3 (E Unit) data graphs in Appendix M and the well nest WN-1 and WN-2 data graphs (E/R Unit) in Appendix N. There is no post-extraction data from the extraction wells in the pilot units (extraction wells EW-1, EW-2, and EW-3 in the E/R Unit, and extraction well EW-4 in the E Unit). Similarly, in the text of Section 5.0, post-extraction groundwater analytical data is discussed only in those sections where the analytical data for the monitoring well clusters are discussed. Explanatory text was added in Sections 5.2.1.3 and 5.2.2.3 to clarify this matter.



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As stated in the response to Specific Comment 4, all pre-extraction groundwater monitoring results are depicted in the graphs provided in the Pilot Project Report. The dates the pumps were turned on/off were added to Section 5.2.1.3. However, with the exception of the samples obtained during the pre- and post-extraction periods, groundwater samples collected from the monitoring wells installed in the pilot units, all samples during the Pilot Project were collected while the pumps were on.

Specific Comment No. 10

Section 5.2.1.2.1, page 30: Did the hydraulic data support the indication of the "drawdown effect."

Response

The hydraulic data obtained during the Pilot Project are summarized in Table 4.3. The presence of the drawdown effect can be confirmed by the presence of vertical (downward) hydraulic gradients in the pilot unit. In evaluating the hydraulic data for the two pilot units, it is noted that prior to pump startup, the groundwater elevations recorded at the five nested monitoring wells screened at different elevations in the upper aquifer are essentially equivalent. Moreover, the groundwater elevations recorded at each of the monitoring wells and the extraction wells (and reinjection wells in the case of the E/R Unit) are nearly identical, varying by a couple hundredths of a foot at the most. However, following pump startup, vertical groundwater gradients are observed between wells screened at different elevations and these gradients are uniformly downwards.

The vertical gradients indicate a vertical component of groundwater flow that would result in the flow of cleaner groundwater from higher elevations in the upper aquifer downwards to the screened interval of the extraction wells. The mixing of cleaner groundwater from above would act to depress contaminant concentrations with time as pumping continued.

(Also, see response to Specific Comment No. 13.)

Specific Comment No. 11

Section 5.2.1.2.3, page 31: Acetone is said to have been a reported non-detect but Graph 3 shows the acetone concentration to be greater than zero. Is this an error or are the non-detect values graphed and if so this should be discussed.



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Response

One-half the detection level was used to plot non-detect concentrations in the graphs. Therefore, non-detect concentrations appear as non-zero concentrations in the graphs. This information was added to Section 5.2 of the report.

Specific Comment No. 12

Section 5.2.1.3.1, page 33: The first sentence of the third paragraph says that the results from only WN-3A, B, C are in Graph 6, but all five are actually shown.

Response

The text in this section has been revised to state that the results from well nest WN-3 are included in Graph 6 in Appendix M.

Specific Comment No. 13

Section 5.2.1.3.2, pages 35 and 36: Based on the data and similar discussions in other sections, the last paragraph on this page does not only apply to SVOCs. This discussion on the drawdown effect, extraction effect, and reinjection effect should be discussed in a separate section.

Response

We concur with the Agency's assessment of this matter. This discussion as it applies to the E Unit, has been moved to Section 5.2.1.2.1, where the drawdown effect is first introduced and discussed.

Specific Comment No. 14

Section 5.2.1.3.2, page 36, second paragraph: This paragraph indicates that there were no rebound effects noted. It is probable based on the flat hydraulic gradients measured in this area, that although the water level rebounded to levels prior to initiation of the testing, the chemistry did not equilibrate to normal steady-state conditions. The lack of rebound indicates that the one-week period was not sufficient to move the cleaner water resulting from the drawdown effects by water in the deeper zone.

Although the concentration data did not indicate notable effects using a cyclic operation, did the data (chemical and hydraulic) provide information on optimizing the pumping rate such that extraction from the lower portion of the aquifer is maximized.



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Response

We agree with the Agency's observations relative to the absence of rebound effects during the one-week shutdown periods in the E Unit. One goal of the cyclical operation of the E Unit was to determine whether cyclical operation would enhance contaminant recovery. It appears, based upon the analytical data, that a one or two-week shutdown would not enhance contaminant recovery.

Although optimization of the pumping rates was not a stated objective of the Pilot Project, much of the data obtained during the Pilot Project will be useful in system scale up.

Specific Comment No. 15

Section 5.2.2.2.4, page 43, last paragraph: Based on the data presented, both the initial and final concentrations in the E Unit were lower than the E/R unit.

Response

The last paragraph in this section was revised to state that the final arsenic concentrations were comparable at the conclusion of the E and E/R Unit tests.

Specific Comment No. 16

Section 5.3.2.2.1, page 51: The first sentence indicates data from the three E/R Unit extraction wells are presented in Graph 3. Graph 3 only shows data from EW-1.

This section discusses the background bromide concentration but presents the bromide data collected between Phase I and II. Was a true background sample collected (i.e., from a near by existing monitoring well or before any pumping activities were performed)?

Response

The analytical data for extraction wells EW-2 and EW-3 were added to Graph 6. Other than that reported, no other bromide data were obtained during the Pilot Project.

Specific Comment No. 17

Section 5.3.2.2.2, page 52: Graph 4 only shows the mass recovery of EW-1 and should be corrected to reflect the text.

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Response

Graph 4 was revised to include bromide mass recovery data for extraction wells EW-2 and EW-3.

Specific Comment No. 18

Section 5.4.2, page 56: Based on the results presented, it is difficult to conclude that the lower mass removal was due to the lower pumping rates rather than drawdown effects and the system not being in equilibrium.

The last sentence should be corrected to "Graphs 1 through 4 in Appendix O depict the cumulative..."

Response

The Agency is correct in its observation. However, based upon the data compiled during the Pilot Project, had the aquifer returned to equilibrium, one could safely conclude that the lower pumping rates would result in less contaminant mass recovery. Nevertheless, the lower mass recovery rate observed during the Pilot Project is clearly the result of both the lower pumping rates and the drawdown effect and the text has been revised to state this fact.

The last sentence has been revised as requested.

Specific Comment No. 19

Section 5.4.2, page 57: Graphs 5 through 15 only show the cumulative mass removal of EW-1 and should be corrected to reflect the text.

Response

This revision was made as requested.

Specific Comment No. 20

Section 5.4.3, page 59, par. 4., 6th sentence: The lower range of the pore volumes needed to achieve optimal mass removal is 1.8, not 1.5.



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Response

The calculation of the number of pore volumes was rounded to the nearest one-half pore volume. Following through on the math suggested by the above comment, the upper range of pore volumes needed to achieve mass removal is 2.8. However, given the uncertainty built into the pore-volume estimates, for the purpose of reporting and interpretation of the Pilot Project data, the range presented in the text is appropriate.

Specific Comment No. 21

Section 5.5, page 61, first bullet: Was the reduction in mass removal really attributed to the lower pumping rates rather than vertical mixing? Does the hydraulic data help to support this conclusion?

Response

Please see the response to Specific Comment No. 18.

Specific Comment No. 22

Section 5.5, page 62, 6th bullet (See specific comment 14.)

Response

Please see response to Specific Comment 14.

Specific Comment No. 23

Section 6: See General Comment No. 1

Response

See response to General Comment No. 1.

Specific Comment No. 24

Section 6.4: See General Comment No. 2



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Response

Please see response to General Comment No. 2.

Specific Comment No. 25

Section 7.2, page 77, last bullet: The last bullet indicates that cyanide treatment is not an issue at the WCP Site due to the low concentrations in untreated groundwater. Is the low cyanide found at the pilot treatment cell representative of the cyanide levels throughout the groundwater remediation target area?

Response

The data summary presented in the Feasibility Study (FS) indicates that the low cyanide concentrations found in the pilot treatment cells are representative of cyanide concentrations throughout the groundwater remediation target area. This will be confirmed with the Groundwater Plume Delineation work that will be implemented this spring.

COMMENTS ON APPENDICES

Appendix A

Section 3.2 -- Numbering is incorrect. And viii (as numbered) is not true, it was my understanding that the wells were left open at all times.

Response

Numbering of items has been corrected. The wells were left open during the Pilot Project. The last numbered paragraph was removed.

Section 3.3 (i) – Were the nested monitoring wells surged and with what?

Response

The nested wells were surged with a small-diameter bailer. This was noted in the appendix.

Section 3.3 (iii) – Were samples actually collected or just field measurements recorded?

Response

The text has been revised to state that field parameters were recorded at regular intervals.



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Section 3.3 (v) - Volume of water removed for development was determined by parameters collected. Was the water added during installation removed first?

Response

For the most part, volume of groundwater introduced into the aquifer during well installation was purged during development and sampling activities.

Section 5.4 -- The coolers left over night were not under "surveillance", but were either in CRA's control or they ensured the coolers were secure (i.e., locked in a trailer).

Response

The text has been revised to indicate that when not under CRA surveillance, sample coolers and containers were secured by locking in the trailer.

Appendix D

Data Validation – Not all the samples in Table 1 were analyzed for all the parameters in Table 2 as implied.

Response

The first paragraph was revised to clarify that groundwater samples were analyzed for selected parameters listed in Table 2 based upon Pilot Project requirements.

Appendix O

Graph 1: was cyanide really zero or is the scale too big to see the actual values?

Response

The total cyanide mass recovery was not zero. Rather, the scale of the graph is dictated by ammonia and total phenolics mass recovery, which is much larger than total cyanide. However, the Appendix O graphs are also provided in the CD in Appendix C. The electronic files in Appendix C are intended to be interactive. When the Appendix O folder is opened from the CD, there are two files. Opening the file named 15670-App-O-Graphs1-4.xls then clicking on the EW4 GenChem tab at the bottom will open the same graph provided as Graph 1 in Appendix O. The total cyanide mass recovery data can then be viewed in two ways. Placing the pointer on the blue squares along the total cyanide plot will automatically open a dialog box that provides the total cyanide mass recovery in milligrams for a particular date during the Pilot Project. Second, the scale of the graph is programmed to change automatically. Deleting the plots for total phenolics and ammonia will change the scale of the graph so the mass recovery



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plot for total cyanide become visible at a scale that better displays total cyanide recovery with time.

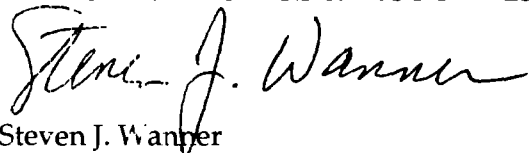
The Appendix O graphs of mass removed should begin at 0 mass at start-up rather than at the mass removed over the first few days.

The mass removal graphs were generated by multiplying the observed concentrations by the volume of groundwater purged during the time between sample intervals. As such, the first point on any mass removal graph was generated by multiplying the startup concentration by the volume of groundwater extracted during the period of time between startup of the pumps and collection of the next sample. This results in a non-zero number, which is displayed on the graphs. Of course, prior to pump startup, mass removal was zero. However, to display the zero point on the graph would require manipulation of the spreadsheets through the insertion of a formula that artificially generates a line between zero and the present startup point. We believe that the mass removal graphs depict the important data and the level of effort required to generate an aesthetic improvement to the graphs is not warranted.

We trust the responses documented herein adequately address the U.S. EPA's comments on the Pilot Project Report. Two copies of the enclosed revisions have been forwarded to U.S. EPA's oversight contractor, CH2M Hill and to Ms. Erin Rednour of the Illinois Environmental Protection Agency. Please feel free to contact the undersigned should you have any questions on this matter.

Yours truly,

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Steven J. Wanper

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